

## A NEW SPECIES OF *APOSTENUS* FROM CALIFORNIA, WITH NOTES ON THE GENUS (ARANEAE, LIOCRANIDAE)

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**ABSTRACT.** The genus *Apostenus* is newly recorded from the Nearctic region and a new species, *Apostenus californicus*, is described from California. Notes are presented on several morphological features of phylogenetic interest.

**Keywords:** Spiders, taxonomy, North America

The genus *Apostenus* currently comprises nine species from the western Palearctic region, including the Canary Islands, and one species each from Mongolia and Sierra Leone [although this latter species is apparently misplaced (Bosmans 1999, J. Bosselaers pers. comm.)]. Previously, three species from the Nearctic region were assigned to *Apostenus* (*A. cinctipes* Banks 1896, *A. acutus* Emerton 1909 and *A. pacificus* Gertsch 1935), but all were eventually transferred to other genera (*Dirksia* Chamberlin & Ivie 1942, *Agroeca* Westring 1861 and *Drassinella* Banks 1904, respectively) thus reinforcing the Old World distribution for the genus (Platnick & Ubick 1989). It consequently comes as quite a surprise to discover a California species that is clearly congeneric with the type species, *Apostenus fuscus* Westring 1851, in both somatic and genitalic features.

This species, which we are describing here as *A. californicus*, resembles *A. fuscus* in having the PER slightly recurved (Fig. 1), anterior tibiae with 5 and metatarsi with 3 pairs of ventral spines, tarsi with annulations and lacking true claw tufts (Figs. 3–7) and the male abdomen with modified ventral setae (Figs. 15, 16). As for genitalic features, the male of both species has a palp with a simple tapering retrolateral tibial apophysis, a narrow

sickle-shaped median apophysis, and a grooved embolus (Figs. 22–24, 27–30), and the female has a median lobe on the epigynum and simple spermathecae with short copulatory ducts (Figs. 25, 26, 31, 32).

Although the California species is clearly an *Apostenus* on morphological grounds, its geographic isolation from the remaining species is puzzling. While it is certainly possible that *A. californicus* is an introduction from the Old World, this seems improbable. Unlike introduced species, which are typically found in disturbed marginal habitats and urban settings, this one has been collected from several pristine habitats of mountainous forest removed from human habitation and so appears to be a native of California. In addition, several of these mountain ranges are separated by wide stretches of low elevation habitats which appear to be impermeable barriers between the known populations and suggest a relictual presence for the species.

Assuming this to be the case, it is tempting to speculate on the biogeographical relationship between *A. californicus* and the remaining *Apostenus* species. Of some interest is the fact that a similar disjunction exists between three closely related liocranid genera. In this case, the California *Hesperocranum* Ubick & Platnick 1991 was argued to be the sister

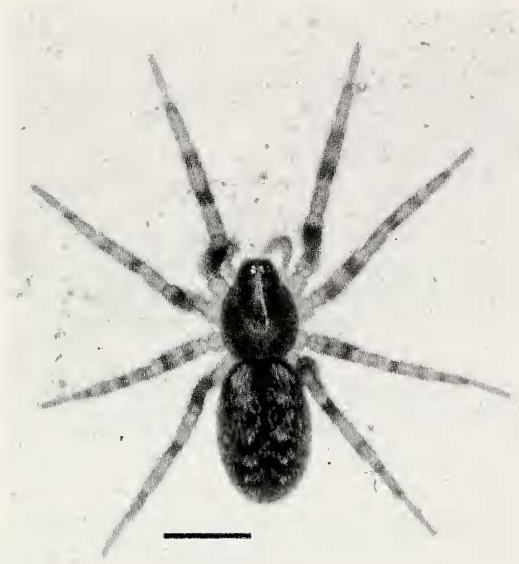


Figure 1.—*Apostenus californicus*, female, dorsal view. Scale bar = 1 mm.

group to the Palearctic *Liocranum* L. Koch 1866 and *Mesiotelus* Simon 1897 (Bosselaers & Jocqué 2002). Whether the same pattern occurs in *Apostenus* will not be known until its many poorly known species are studied.

#### METHODS

Observations were made using a Leica MZ12.5 dissecting microscope, Nikon SL3D compound microscope and Leica M420 dissecting microscope coupled with a JVC KY-F70B digital camera and a Syncrosopy Auto Montage system. Specimens were prepared for scanning by cleaning in a Branson 1510 Ultrasonicator, dried with a Denton DCPI Critical Point Dryer, coated with AuPd with a Denton Vacuum Desk II Sputter Coater and examined with a Hitachi S-520 Scanning Electron Microscope.

Spiders were collected primarily by sifting oak leaf duff, both in the field and in samples brought back to the laboratory, and extracted with a Berlese funnel. Immatures removed live from the sifting were often reared to maturity. Oaks, both deciduous and perennial, were targeted as they are the most prevalent montane tree allowing leaf accumulation and subsequent decomposition in which spiders and their prey are found. Because initial *Apostenus* specimens were discovered from 1700–2100 meter elevations, collections were con-

centrated above the 1500 meter level. Collections were also concentrated from September through March because the rainless, summer Mediterranean climate desiccates leaf litter sufficiently that collecting is often fruitless. These factors bias the collection data presented here and may not indicate the actual availability of *Apostenus* in southern California mountains.

Description largely follows the format of Ubick & Platnick (1991). Leg and palp measurements are given as: total length (femur + tibia-patella + metatarsus + tarsus). Measurements are in mm.

Abbreviations: ALE = anterior lateral eye; ALS = anterior lateral spinneret; AME = anterior median eye; PE = posterior eyes; PER = posterior eye row; PLE = posterior lateral eye; PLS = posterior lateral spinneret; PME = posterior median eye; PMS = posterior median spinneret; RTA = retrolateral tibial apophysis.

Specimens are deposited at the California Academy of Sciences (CAS), San Diego Natural History Museum (SDM), University of California at Riverside (UCR) and the collections of T. Prentice (TRP) and D. Ubick (CDU).

#### TAXONOMY

##### Family Liocranidae

##### *Apostenus* Westring 1851

##### *Apostenus californicus* new species

**Type material.**—Male holotype and female allotype from moist *Quercus kelloggii* duff at intersection of Cedar Springs and Pacific Crest Trails off Morris Ranch Road, 33°40'00"N, 116°34'31"W, 2090 m, San Jacinto Mountains, Riverside County, California, U.S.A., 7 January 2001, R. Vetter (CAS).

**Paratypes:** U.S.A.: California: Kern County: 1 ♂, 1 juvenile, Los Padres National Forest, 100 m S of snow gate on Cuddy Valley Road toward Mount Pinos, (at mile marker 6.01), 1 km S of intersection with Cerro Mil Potrero Hwy, 34°49'51"N, 119°05'03"W, 1895 m, in moist *Quercus* shrub duff, 12 April 2003, R. Vetter (UCR); 3 juveniles, same road as above but at mile marker 8.95, 34°49'17"N, 119°05'01"W, 2105 m, in moist *Quercus kelloggii* duff, 12 April 2003, R. Vetter (UCR); Riverside County: 1 juvenile, San Jacinto Mountains: same locality as holotype, 29

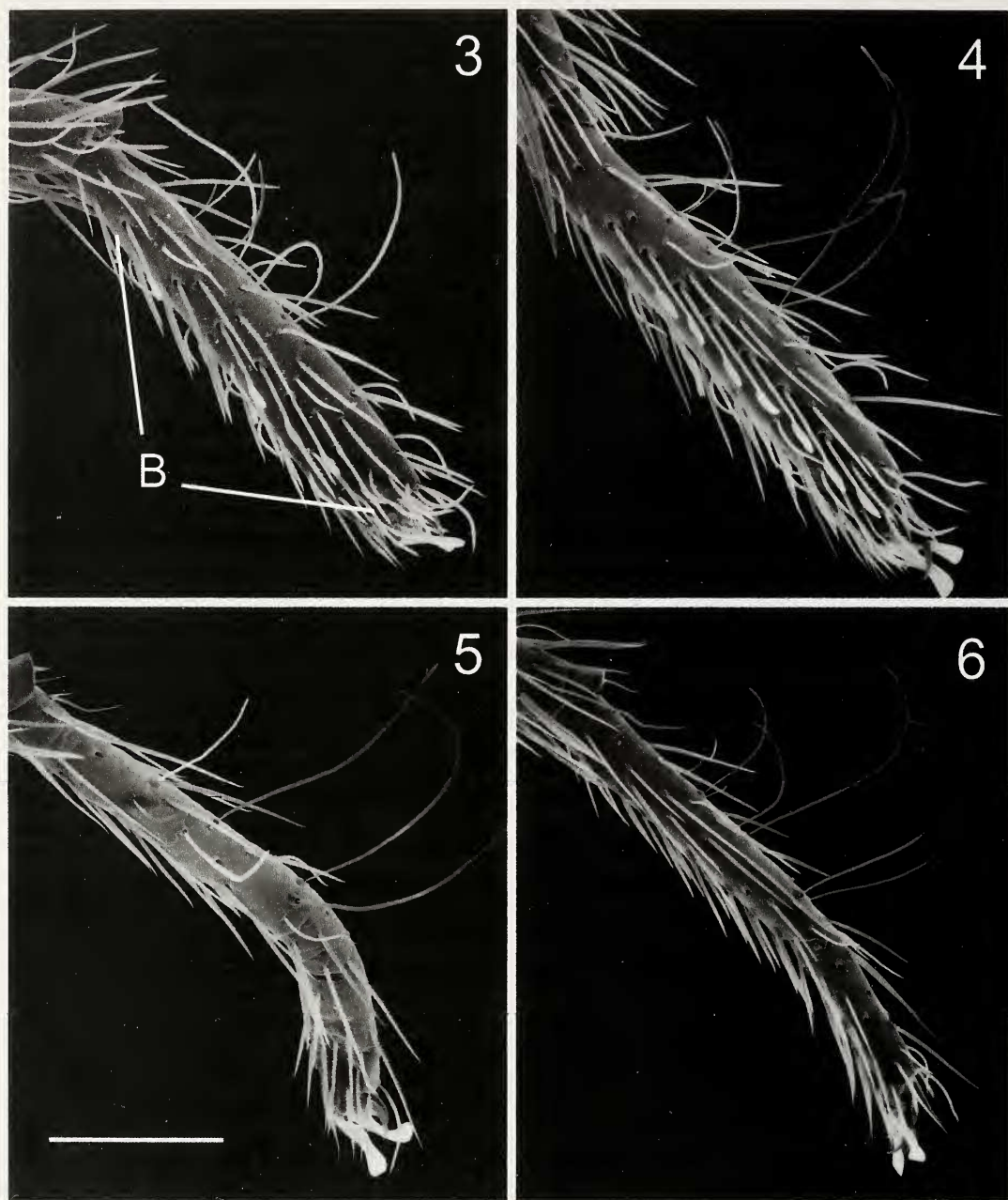




Figure 2.—Map of southern California showing the known localities of *Apostenus californicus*. The northernmost locality (Inyo County) is tentative, being based on juvenile specimens.

March 2001; 4 juveniles (3 ♀ reared to maturity), 28 April 2001; 1 juvenile, along Cedar Springs Trail (Trail 4E17), 1950 m, in dry *Quercus wislizenii* duff, 7 January 2001; 6 ♂, 6 ♀, 9 juveniles (1 ♀ reared to maturity), on Cedar Springs Trail off Morris Ranch Rd., 33°39'42"N, 116°34'41"W, 1790 m, in moist *Quercus chrysolepis* duff, 30 September 2001; 4 females, 4 juveniles, near Cedar Springs trailhead, 33°39'26"N, 116°35'01"W, 1720 m, in dry *Quercus chrysolepis* oak duff near streambed, 7 January 2001; 1 juvenile, in moist *Quercus chrysolepis* oak duff under snow, 18 March 2001; all above collected by R. Vetter (6 ♂ and 4 ♀ at CAS, remainder at UCR); 2 ♂, 2 ♀, 1 juvenile, James Reserve, Lake Fulmor, 33°48'31"N, 116°46'36"W, 1640 m, in dry *Quercus kelloggi* oak-pine duff next to wet stream, 8 October 2001, R. Vetter and T. Prentice (UCR); 1 ♀, 4.2 km N Lake Fulmor on Hwy 243, trailhead of trail 2E35, 33°49'39"N, 116°47'44"W, 1575 m, in extremely dry *Quercus* leaf duff, 26 September 2003, R. Vetter (UCR); 1 ♀, 1 juvenile, Spillway Canyon, S of Lake Hemet, 33°39'07"N, 116°41'32"W, 1365 m, probably from oak litter, 29 May 2001, T. Prentice & D. Popko (UCR); San Bernardino County: San Bernardino Mountains: 1 ♀, 4.8 km W Angelus Oaks general store on Hwy 38, 34°10'N, 116°52'W, 1820 m, in *Quercus kelloggi* duff, 6 June 2003, R. Vetter (UCR); 1 ♀, Forest Falls, Momyer-Alger Trail, 34°05'05"N,

116°55'07"W, 1660 m, 1 April 2001, T.R. Prentice (TRP); 6 juveniles (1 ♂, 2 ♀ reared to maturity), in oak duff, 28 May 2001, T. Prentice (UCR); 1 juvenile (♀ reared to maturity), 17 April 2002, T. Prentice (TRP); 1 ♀, 2 juveniles, Forest Falls, near Vivian Creek trailhead (Trail 1E08), 34°04'58"N, 116°53'35"W, 1850 m, in dry scrub oak duff, 25 March 2001, R. Vetter (UCR); 2 ♀, 3 juveniles, 1 April 2001, T. Prentice (TRP); 1 juvenile, Forsee Creek and Hwy 38, 0.4 mi E of Camp Cedar Falls turnoff, 34°09'29"N, 116°55'54"W, 1850 m, in *Quercus* sp. duff, 15 June 2003, R. Vetter (UCR); 1 ♀, 1 km W Jenks Lake Loop Road East turnoff, 34°10'14"N, 116°50'29"W, 2093 m, in scrub oak duff, 6 May 2001, R. Vetter (UCR); 1 penultimate male, Ponderosa Pines trail (1E19) near W entrance to Jenks Lake Loop Road on Hwy 38, 34°09'56"N, 116°54'46"W, 1950 m, in *Quercus* sp. duff, 15 June 2003, R. Vetter (UCR); 3 ♀, 6 juveniles, Mill Creek Canyon, 1.3 km E of Hwy 38 on Valley of the Falls Dr., 34°05'42"N, 116°56'44"W, 1450 m, 2 March 2002, R. Vetter (UCR); 1 juvenile, near Seven Oaks, 1.6 km N of Hwy 38 on Glass Rd, 34°10'29"N, 116°54'00"W, 1820 m, in mixed *Quercus kelloggi* and pine duff, 6 May 2001, R. Vetter (UCR); 1 ♀, 1 juvenile, in *Quercus kelloggi* and *Q. chrysolepis* duff, 6 June 2003, R. Vetter (UCR); 1 ♀, 3 juveniles, Skinner Ridge between Skinner Creek and Mountain Home Creek, 34°06'48"N, 116°58'53"W, 1500 m, in oak duff, 29 November 1983–26 January 1984, M. Narog (UCR); 1 ♂, 23 January 1986, M. Narog (UCR); San Diego County: 1 ♂, 5 ♀, 1 penultimate ♂, 3 juveniles, Cleveland National Forest, Julian, 4839 Pine Ridge Ave., 33°02'34"N, 116°37'49"W, 1300 m, in mixed *Quercus kelloggi* and *Quercus* sp. leaf duff, 31 March 2002, R. Vetter (UCR); 2 penultimate ♂, Cleveland National Forest, ca. 1.6 km N Cibbets Flat, 32°46'38"N, 116°26'56"W, 1250 m, 12 July 2003, J. Berrian (SDM); 1 ♂, 1 ♀, Descanso Junction, 32°50'N, 116°36'W, 1040 m, ex willow duff, 31 March 1961, E. Lindquist (CDU); 4 juveniles, Laguna Mountain across from fire station, 1/8 mi N Camp Ole Station, 32°53'N, 116°25'W, 1755 m, in duff of black oak, *Quercus kelloggi*, 20 February 2003, L. Merrill and R. Vetter (UCR); 2 ♀, Palomar Mountain State Park, Doane Pond trail, 20 m from parking lot, 33°20'29"N, 116°54'05"W, 1415 m, in mixed *Quercus* oak



Figures 3–6.—*Apostenus californicus*, lateral views of tarsi: 3, 4. Tarsus I showing leg bristles (B); 5, 6. Tarsus IV; 3, 5. Male; 4, 6. Female. Scale bar = 150  $\mu$ m (3–5), 200  $\mu$ m (6).

duff on creek bank next to road, 20 January 2003, R. Vetter (UCR); 1 ♀, 0.3 mi W of Ran-chita on Hwy S22, 33°12'37"N, 116°32'30"W, 1193 m, in oak leaf duff, 16 March 2003, R. Vetter (UCR).

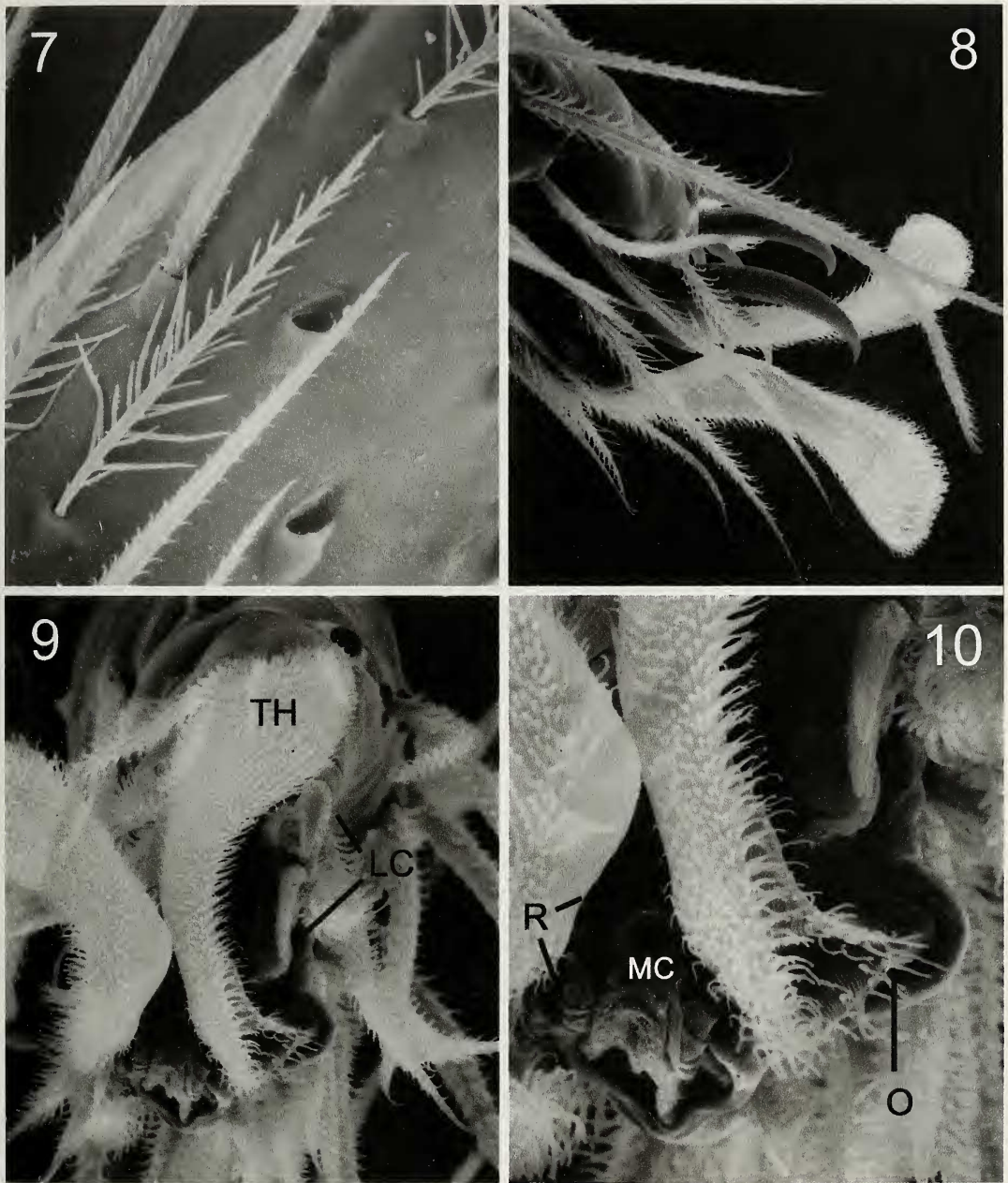
*Non-paratypes (identification tentative):* U.S.A.: *California*: 2 juveniles, Inyo County: Independence: Oak Creek Campground, just

beyond Mt. Whitney Fish Hatchery, 36°50'31"N, 118°15'37"W, 1455 m, in black oak duff, 7 May 2003, E.F. Drake (UCR).

**Etymology.**—The species name refers to its known distribution.

**Diagnosis.**—This is the only *Apostenus* known from the Nearctic region. The male is similar to *A. annulipedes* Wunderlich from

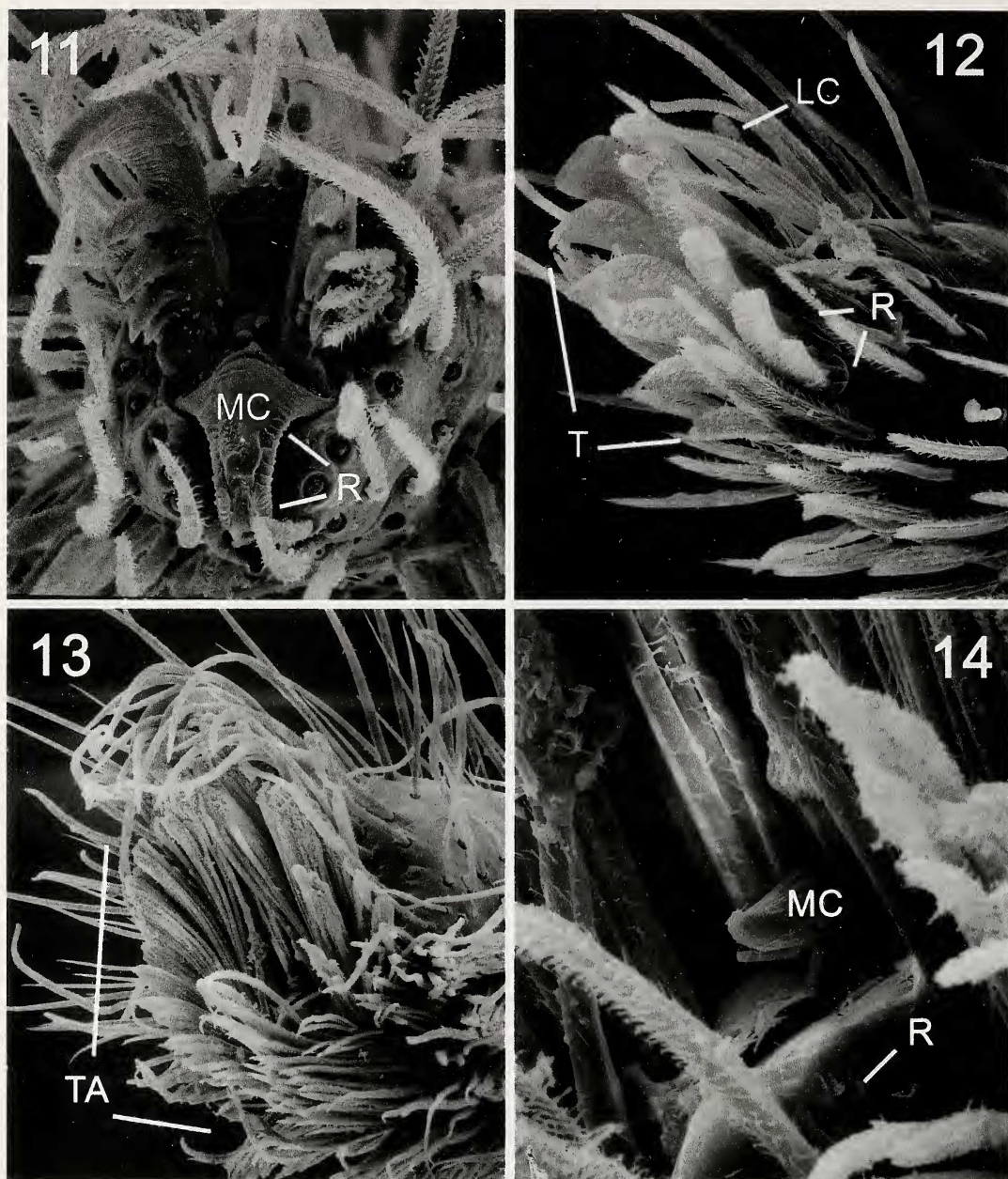




Figures 7–10.—*Apostenus californicus*, male leg parts: 7. Tibia IV showing plumose hair; 8–10. Apices of tarsus I; 8. Lateral view; 9. Apical view showing enlarged tenent hairs (TH) and lateral claw (LC); 10. Close-up of apical view showing median claw scar (MC) with lateral ridges (R) and origin of tenent hair laterad of lateral claw (O).

which it differs in having the median apophysis longer and originating more basad on the bulb. The female is close to *A. grancanariensis* Wunderlich (male unknown) but has the spermathecae more widely separated. (compare Figs. 22–26 with figs. 750e–h and 751–751a in Wunderlich 1992).

**Description.**—*Male* (holotype, range of other males in parentheses;  $n = 8$ ): Total length 2.42 (2.24–2.95). Carapace length 1.10 (0.98–1.15), width 0.88 (0.79–0.94), height 0.34. Clypeus 0.08 (at AME), 0.05 (at ALE). Fovea length 0.18. Abdomen length 1.32, width 0.74. Eye sizes and interdistances:



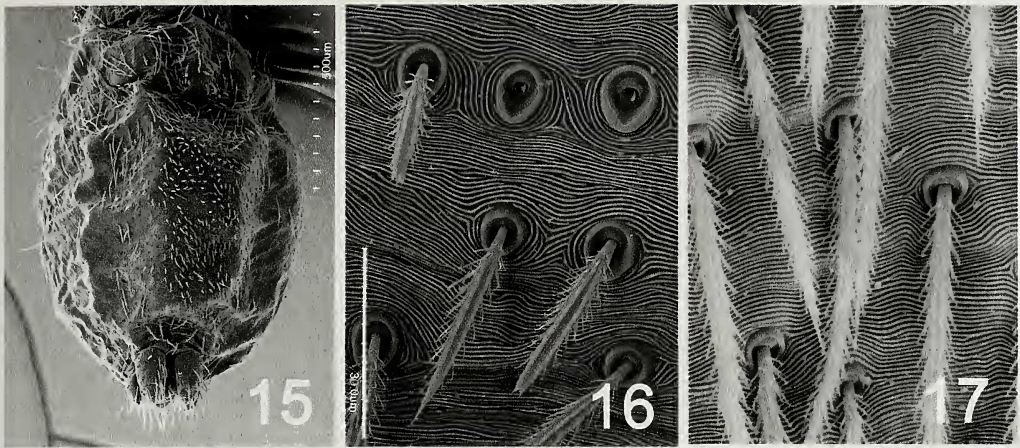
Figures 11–14.—Apices of tarsus I of various spiders: 11. *Liocranum* sp., apical view showing median claw scar (MC) with lateral ridges (R) and the absence of a tuft or tenent hairs; 12. *Drassinella* sp., lateral view showing lateral claw (LC) and tuft (T) arising from lateral ridges (R) of median claw scar; 13–14. *Titiotus* sp.; 13. Lateral view showing claw tuft analog (TA); 14. Close-up showing reduced median claw (MC) with lateral ridges (R).

AME 0.04, ALE 0.08, PME 0.06, PLE 0.06, AME-AME 0.03, AME-ALE 0.02, PME-PME 0.06, PME-PLE 0.04, ALE-PLE 0.04, AER 0.25, PER 0.30. Palpus and leg lengths: Palpus: 1.10 (0.38 + 0.34 + 0 + 0.38); Leg I: 3.38 (0.90 + 1.22 + 0.64 + 0.62); Leg II:

2.96 (0.84 + 1.02 + 0.58 + 0.52); Leg III: 2.84 (0.76 + 0.94 + 0.64 + 0.50); Leg IV: 4.06 (1.06 + 1.34 + 0.98 + 0.68). Leg formula 4123.

*Color:* Carapace brown, black in eye region and along margin, light brown at fovea. Ab-





Figures 15–17.—*Apostenus californicus*, abdomen: 15, 16. Male; 15. Ventral view showing distribution of modified setae along midline; 16. Close-up of modified setae; 17. Female, comparable part of abdomen showing unmodified setae. Scale bar = 500  $\mu$ m (15), 30  $\mu$ m (16, 17).

domen dorsum dark brown to black with two short longitudinal pale marks anteriorly, followed by two pairs of transverse marks, and 2–3 transverse bands posteriorly; venter light brown with dark median maculation. Legs light brown with dark annulations, anterior femora and tibia dark brown, coxae light brown. Sternum brown.

**Vestiture:** Carapace largely glabrous, eye region and clypeus with strong setae and recumbent white scales in longitudinal band. Sternum with setae mostly at margins and at posterior projection. Abdomen dorsum densely setose, anteriorly with recumbent white setae, venter with modified short setae (Figs. 15, 16); appendages densely clothed with long setae, spines, plumose hairs and trichobothria.

Carapace piriform in dorsal view, somewhat flattened, highest at fovea. AME smallest, about half the diameter of ALE, PE subequal slightly smaller than ALE, AER straight, PER slightly recurved in dorsal view. Chelicerae not geniculate, lacking boss, anterior face with several setae, no spines, retro-margin with 2 teeth, promargin with 3 teeth. Sternum rounded, anteriorly truncate, with posterior extension between coxae IV, with marginal setae, especially at posterior extension. Precoxal triangles absent. Labium rounded, wider than long, one half length of endites; endites quadrate, with serrula on anterior margin.

**Abdomen:** lacking dorsal scute; epigastric furrow lacking epiandrous spigots. Spinneretes

with colulus represented by two setae; ALS conical, 2-segmented, contiguous, twice the width of the PLS; ALS with 3 spigots (piriform) and 3 nubbins; PMS with 3 spigots (aciniform) and 2 nubbins; PLS with 3 spigots (aciniform) and 3 nubbins.

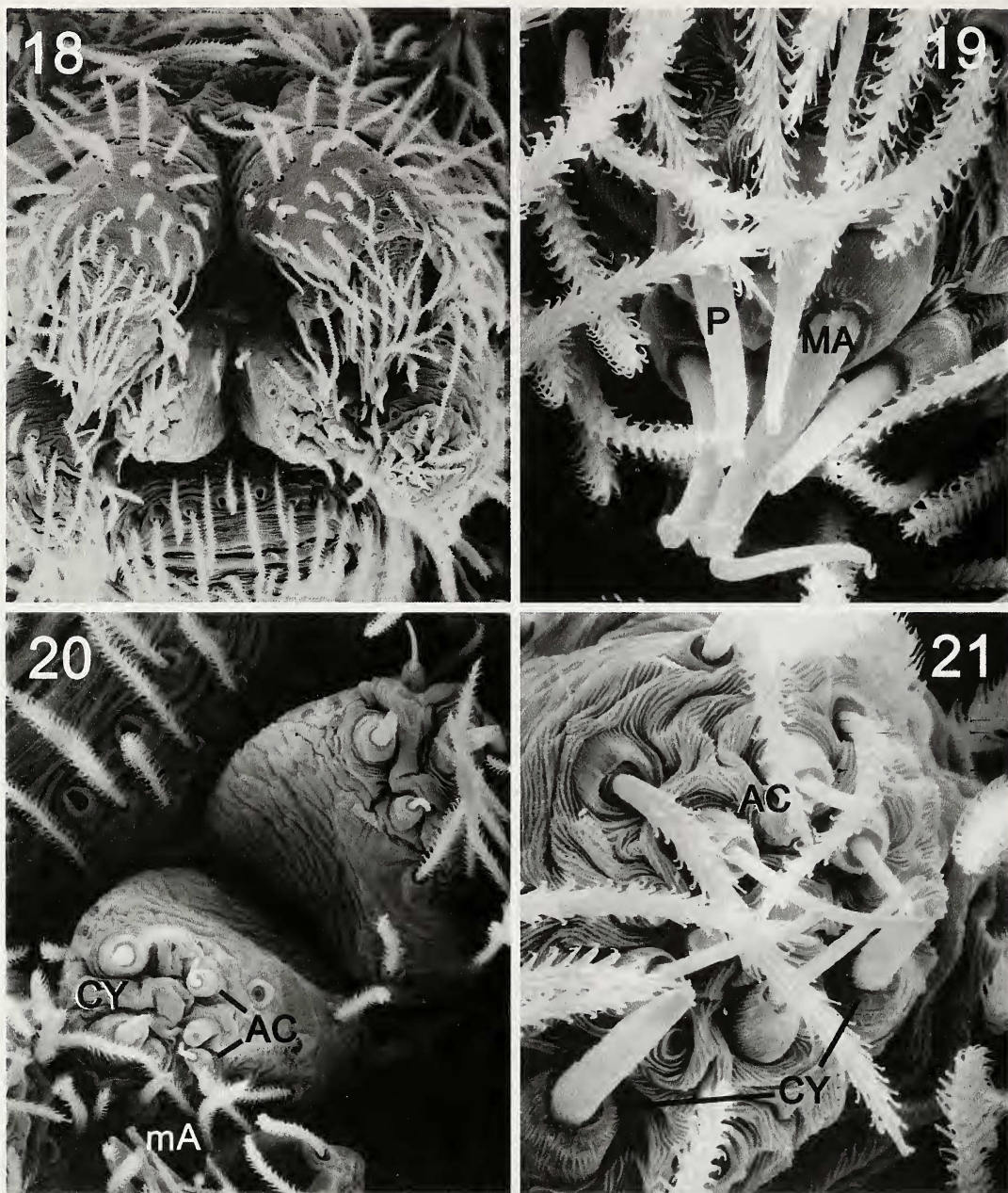
Tarsi, metatarsi, and tibiae with dorsal trichobothria in two rows. Tarsi subsegmented; anterior with lateroventral rows of spatulate bristles (Fig. 3); posterior longer than anterior, bent in apical third (Fig. 5); with two pectinate lateral claws and two broad tenent hairs originating laterad of claws (Figs. 8–10). Leg spines: I: metatarsus v2–2–2, tibia v2–2–2–2–2, femur d1–1–0, p0–0–1, v0–0–0–8 (bristles); II: metatarsus v2–2–2, tibia v2–2–2–2, femur d1–1–0, v0–0–0–8 (bristles); III: tibia d2–1, v1–1–0; IV: metatarsus d2–2–0, v2–2–0, tibia d1–2–2, v2–2–0.

**Palpus:** Cymbium with dorsoapical scopula, lacking trichobothria. Bulb with median apophysis sickle-shaped, conductor absent, embolus broad with apical groove and angular base which forms a lock with the subtegulum. RTA short, curved, thorn-like prong. Femur lacking ventral process. (Figs. 22–24, 27–30)

**Variation:** Penultimate males lack the modified setae on the venter of the abdomen and the recumbent scales on the carapace and abdomen.

**Female (allotype, range of other females in parentheses; n = 8):** Total length 3.14 (2.30–3.60). Carapace length 1.14 (1.05–1.32), width 0.94 (0.85–1.05), height 0.47. Clypeus





Figures 18–21.—*Apostenus californicus*, female spinnerets: 18. entire spinning field; 19. ALS, showing major ampulate (MA) and piriform (P) spigots; 20. PMS, showing minor ampulate (mA), cylindrical (CY), and aciniform (AC) spigots; 21. PLS, showing cylindrical (CY) and aciniform (AC) spigots.

0.08 (at AME), 0.04 (at ALE). Fovea length 0.14. Abdomen length 1.80, width 1.14. Eye sizes and interdistances: AME 0.04, ALE 0.08, PME 0.07, PLE 0.07, AME-AME 0.03, AME-ALE 0.02, PME-PME 0.05, PME-PLE 0.03, ALE-PLE 0.05, AER 0.34, PER 0.26. Palpus and leg lengths: Palpus: 1.12 (0.40 +

0.38 + 0 + 0.34); Leg I: 3.28 (0.98 + 1.20 + 0.64 + 0.46); Leg II: 3.02 (0.90 + 1.10 + 0.60 + 0.42); Leg III: 2.86 (0.78 + 0.98 + 0.60 + 0.50); Leg IV: 3.98 (1.06 + 1.36 + 0.94 + 0.62). Leg formula 4123.

Color as in male. Vestiture as in male except that abdominal venter has long slender



setae and the carapace and abdomen lack the conspicuous recumbent scales. Form essentially as male except that tarsi are shorter and tarsi IV straighter than in male.

Epigynum with rounded lateral lobes and triangular median lobe; copulatory openings in median grooves. Vulva with 2 rounded spermathecae, short copulatory ducts, and curved fertilization ducts. Spinnerets as in male; PMS conical, not compressed; ALS with 6 long spigots (4 piriforms and 2 larger major ampulates); PMS with 2 large cylindrical spigots, 1 smaller minor ampulate, and 3 small aciniforms; PLS with 2 cylindrical and 5–6 aciniform spigots (Figs. 18–21).

**Sexual dimorphism.**—Adult males have a vestiture of short setae on the abdominal venter and recumbent white scales on the carapace and abdominal dorsum. Males have tarsi longer, and posterior tarsi more strongly bent, than females.

**Biology.**—This species is widespread in the mountains of southern California and has been collected from several contiguous localities each in San Diego County and the San Jacinto and San Bernardino Mountains. It is also known from two isolated localities to the west in Kern County, and a tentative record, based on juveniles, to the north in Inyo County. The spider occurs in leaf litter (which varies from moist to slightly dry) of various oak species (with two records from oak and pine duff and one from willow) at elevations from 1040–2100 m. Males have been taken from September–April, females from September–June. In the lab, juvenile *Apostenus* were successfully reared to maturity on a diet of Collembola, Psocoptera, and Lepidoptera larvae.

**Distribution.**—Known only from southern California (Fig. 2).

## DISCUSSION

Our examination of *A. californicus* has turned up some observations that have not been adequately, if at all, described in the literature. To date, the most complete description of *Apostenus* is in the recent analysis of the clubionoid genera by Bosselaers & Jocqué (2002), to which we can add the following:

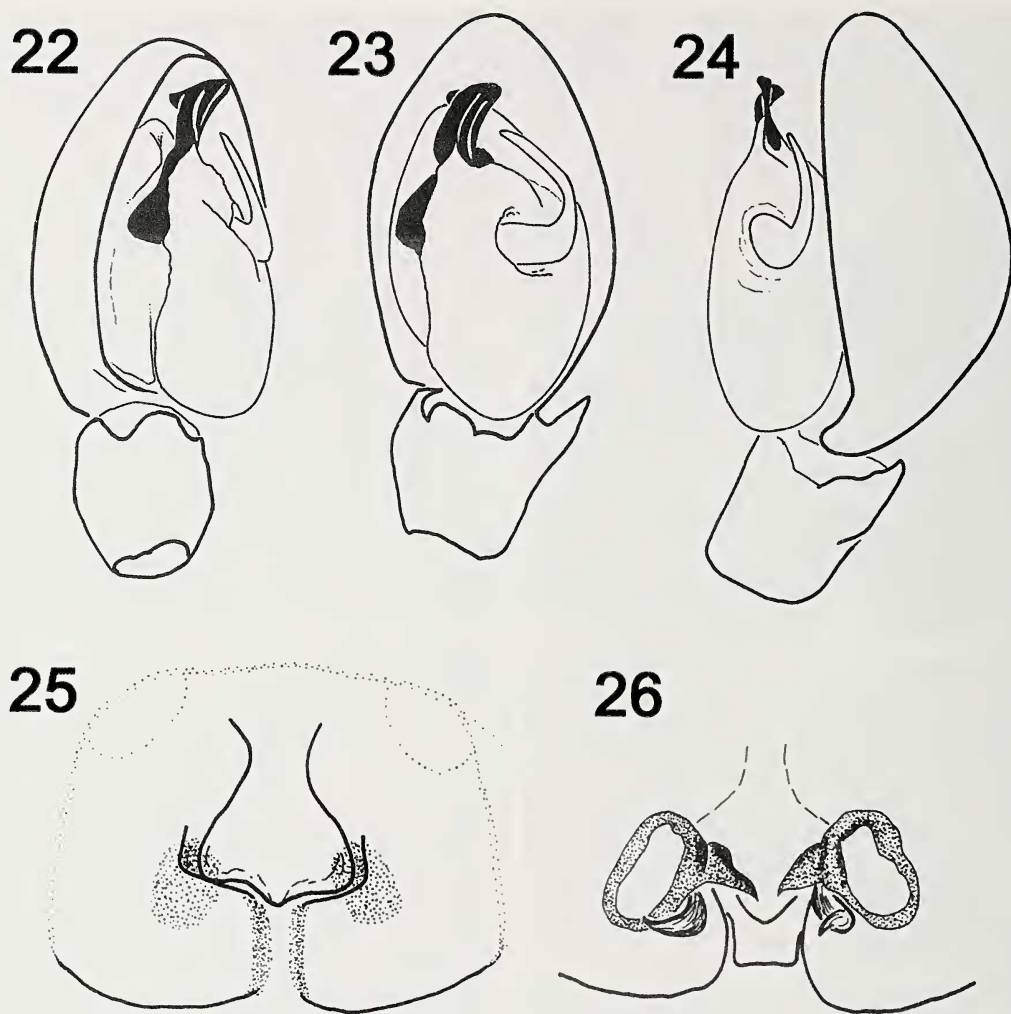
**Dimorphic abdominal setae.**—The presence of short setae ventrally on the male abdomen (Figs. 15, 16) was not scored by Bosselaers & Jocqué (2002), but occurs in *A. californicus* and *A. fuscus* and appears to be

an autapomorphy for *Apostenus*. Although Wunderlich (1999) refers to the presence of modified setae in some species of *Agroeca* Westring 1861, of the species we examined, the males have normal setae (*A. minuta* Banks 1895, *A. pratensis* Emerton 1890, and *A. trivittata* (Keyserling 1887)), slightly shorter setae (*A. ornata* Banks 1892) or short ones interspersed with normal setae (*A. brunnea* (Blackwall 1833), J. Bosselaers pers. comm.).

**Claw tufts.**—The tip of the tarsus bears two spatulate tenent hairs (Figs. 8–10) which also appear to be an autapomorphy for the genus. Although this was interpreted as a claw tuft by Bosselaers & Jocqué (2002: Character 63), it is clearly not homologous to a true tuft, which is generally understood to arise from the transformed median claw (Forster 1970). In *Apostenus californicus*, the modified hairs originate laterad of the paired claws and the region of the median claw is represented by a vestige consisting of a central protuberance and a series of lateral ridges (Figs. 9, 10). In a true claw tuft, the modified setae originate from the lateral ridge portion of the median claw vestige, as for example in *Drassinella* (Fig. 12). Such tufts are of a different origin, as are the tufts in 3-clawed spiders. Forster (1970) recorded various forms of claw tuft analogs in several 3-clawed desid genera from New Zealand, and similar analog tufts are also found in the 3-clawed *Titiotus* Simon 1897 and related tengellids from the Nearctic region (Figs. 13, 14). Finally, claws lacking tufts of any sort are found in several liocranid genera, for example, in *Liocranum* (Fig. 11). Detailed observations of these structures will be necessary to determine homology.

**Bent posterior tarsi.**—All tarsi are subsegmented in both sexes of *Apostenus*, but tarsi III & IV are much more markedly bent in the male (Figs. 3–6). Subsegmented and bent posterior tarsi occur in several Holarctic liocranid genera (*Agroeca*, *Agraecina* Simon 1932, *Cybaeodes* Simon 1878, *Neoanagraphis* Gertsch & Mulaik 1936, and *Scotina* Menge 1873). This character was first noted by Wunderlich (1999) and interpreted as a synapomorphy by Bosselaers & Jocqué (2002: Character 9) for this group of genera. Interestingly, in *Apostenus* the subsegmented tarsi occur in both sexes, but only in males of *Agroeca* and *Neoanagraphis*.

**Tegulum/subtegulum lock.**—The locking



Figures 22–26.—*Apostenus californicus*, genitalia: 22–24. Male left palpus with embolus in black; 22. Prolateral-ventral view; 23. Ventral view; 24. Retrolateral view; 25, 26. Female epigynum; 25. Ventral view; 26. Dorsal view.

mechanism of the tegulum to subtegulum was first observed by Griswold (1993) in the Lycosoidea and its basal sister groups. A similar locking structure occurs in *Apostenus* (Figs. 22, 29), which has a distinct subtegular lobe, but may differ in having the tegular lobe represented by the embolar base. This locking mechanism was also recorded in *Agroeca*, *Scotina*, and *Phrurotimpus* Chamberlin & Ivie 1935 (Bosselaers & Jocqué 2002: Characters 130, 131).

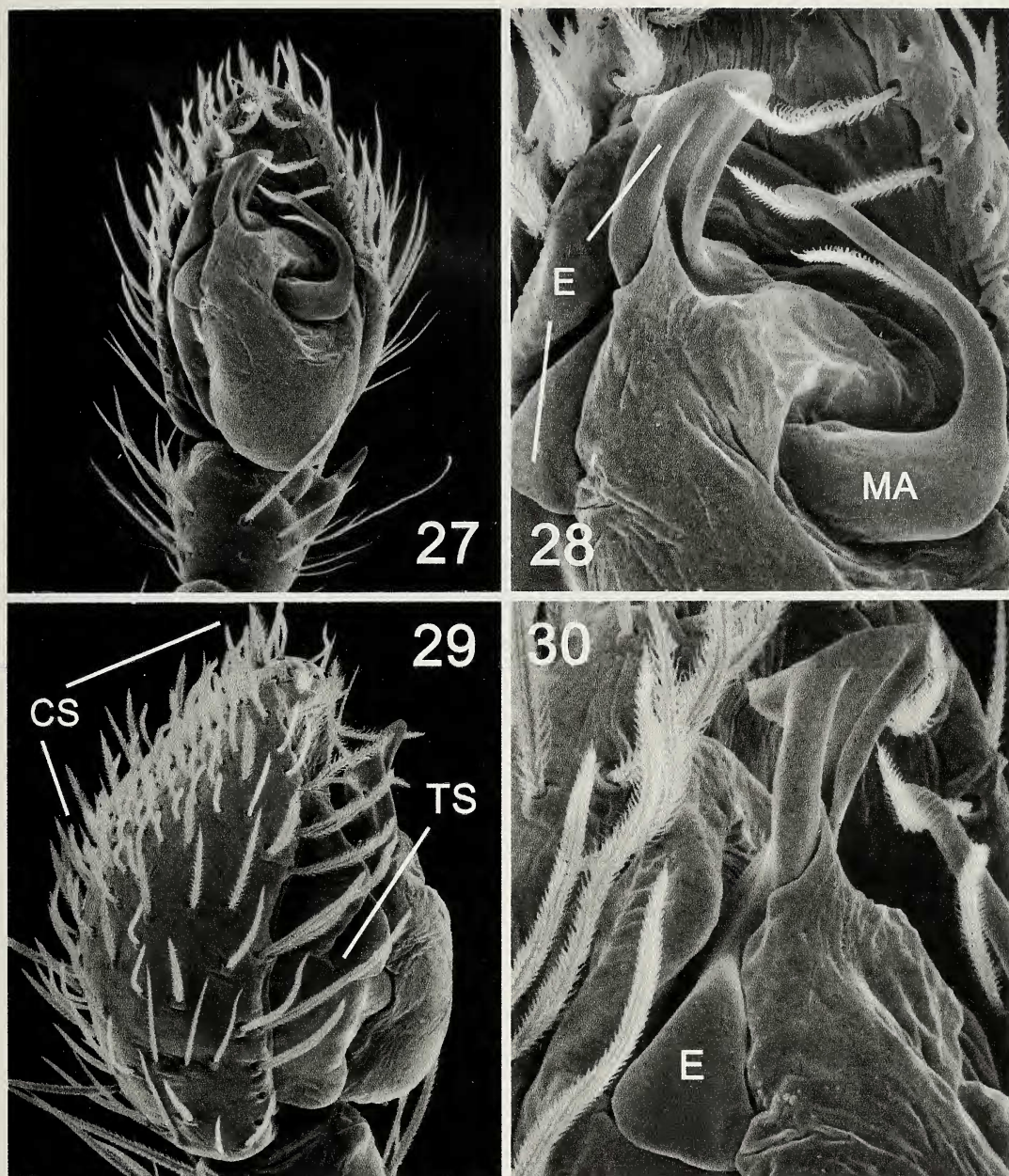
**Cymbial scopula.**—A scopula on the dorsoapical part of the cymbium was not noted by Bosselaers & Jocqué (2002), but occurs in *Apostenus californicus* (Fig. 29), at least in

some *Agroeca* (observed in *A. pratensis*), and is also found in a number of lycosoids and their kin (Griswold 1993).

**Epigynum with scape.**—Bosselaers & Jocqué (2002, Character 148) interpreted the middle piece of the epigynum of *Apostenus* as a scape. But unlike a scape, it is broadly attached to the rest of the epigynum (Figs. 25, 31, 32) and more closely resembles the median lobe of amaurobiids, lycosoids, and some other spiders.

**Embolus insertion.**—Although the embolus of *A. californicus* is apical in position, its insertion as seen in prolateral views is clearly at the middle of the bulb (Figs. 22, 29, 30)





Figures 27–30.—*Apostenus californicus*, male left palpus: 27, 28. Ventral view with close-up showing embolus (E) and median apophysis (MA); 29, 30. Prolateral view showing cymbial scopula (CS) and regular-subtegular locking mechanism (TS) and a close-up showing base of embolus (E).

and not apical as recorded by Bosselaers & Jocqué (2002: Character 140)

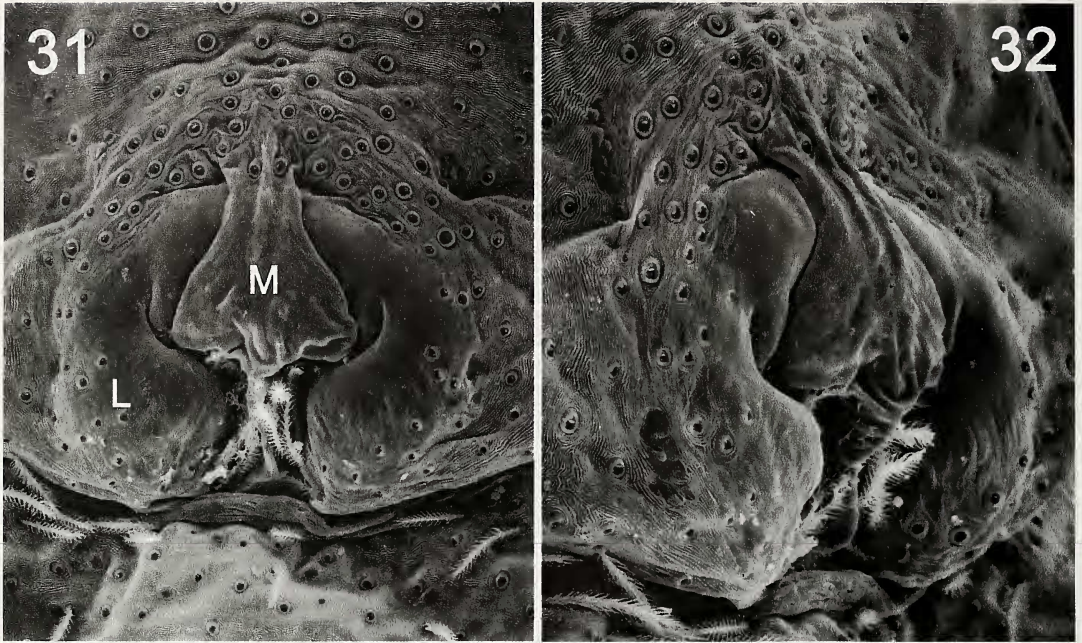
**Abdominal scute.**—Bosselaers & Jocqué (2002) indicate the presence of a male abdominal scute in *Apostenus* (Character 102); but this was not observed in *A. californicus*.

**Plumose hairs.**—Bosselaers & Jocqué (2002) state that *Apostenus* lacks plumose

hairs (Character 57); in *A. californicus* they are present on the legs (Fig. 7).

**Leg bristles.**—These bristles have been interpreted as diminutive spines (Ubick & Platnick 1991) and occur in a wide number of clubionoids. Although they were not recorded for *Apostenus* by Bosselaers & Jocqué (2002, Characters 4 & 5), they are present in *Apos-*





Figures 31–32.—*Apostenus californicus*, female epigynum, setae removed: 31. Ventral view showing lateral (L) and median (M) lobes; 32. Ventrolateral view.

*tenus californicus* (Figs. 3, 4), and also occur, at least on anterior tarsi, in other species of *Apostenus* and in *Agroeca* and *Liocranoeca*.

The family placement of *Apostenus* is presently in a state of flux. Although traditionally associated with the Liocranidae, the most recent analysis of the clubionoid genera (Bosselaers & Jocqué 2002), argues that the genus belongs neither to the Liocranidae, *sensu stricto*, nor to the Phrurolithinae (which they transferred to the Corinnidae) but to an intermediate clade which was not assigned to family. As mentioned above, the genus appears to cluster with the several genera having subsegmented tarsi. These genera also lack claw tufts and precoxal triangles and show some affinities to the lycosoid complex, suggested by the bulbal locking mechanism and cymbial scopula, which may be worth exploring further.

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